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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/551,212	09/28/2005	Vladimir Mikhailovich Berezutskiy	7885-104/10811046	4519
167 7590 03/24/2011 FULBRIGHT AND JAWORSKI LLP 555 S. FLOWER STREET, 41ST FLOOR LOS ANGELES, CA 90071				
EXAMINER SINGH, PREM C				
ART UNIT 1771		PAPER NUMBER		
NOTIFICATION DATE 03/24/2011		DELIVERY MODE ELECTRONIC		

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

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**Office Action Summary****Application No.**

10/551,212

**Applicant(s)**BEREZUTSKIY, VLADIMIR  
MIKHAILOVICH**Examiner**

PREM C. SINGH

**Art Unit**

1771

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 05 February 2011.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 11, 18-23, 26-40, 42, 43, 45, 46 and 48-62 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 11, 18-23, 26-40, 42, 43, 45, 46 and 48-62 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☐ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application  
6) ☐ Other: \_\_\_\_\_

**DETAILED ACTION**

***Response to Amendment***

1. Cancellation of claim 1 and addition of new claim 62 is noted.
2. Specification in 1½ line-spacing is noted.
3. Objection to claim 19 is withdrawn.
4. New ground of rejection necessitated by new claim 62 follows.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. Claims 11, 18, 20-23, 26-40, 42, 43, and 50-62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann").

7. With respect to claim 62, Piccoli discloses a method for treatment of a hydrocarbon liquid media, which includes adsorption of impurities (See column 1, lines 8-11, column 2, lines 62-67), comprising thiophenes and their higher homologs and heteroatom compounds involving nitrogen and oxygen (See column 3, lines 32-47) contained in the liquid media by a particulate catalyst impregnated sorbent at a temperature between 0°C and 150°C, separation and removal of impurities adsorbed (See column 2, lines 40-47, 62-67; column 3, lines 1-6), while separation and removal of oxides of impurities is executed by washing the particulate catalyst impregnated sorbent with a polar solvent and regeneration of the particulate catalyst impregnated sorbent is carried out with heat and/or by the blowing through a hot gas at a temperature between 100 and 200°C (See column 2, lines 58-61; column 3, lines 7-16).

Piccoli invention discloses washing with polar solvents, water, acetone, methanol, ethyl acetate or their mixtures such as hydrocarbons, paraffins from 5 to 8 carbon atom, or aromatics (See column 3, lines 14-17), however, the invention does not appear to specifically disclose a distillation step following washing. Piccoli also discloses removal of liquid from the adsorbed material (See column 6, line 32, 56; column 7, lines 25-28).

It would have been obvious to one with ordinary skill in the art at the time of invention to use any appropriate method, including distillation as claimed, to remove wash liquid from the adsorbed material for reuse.

Piccoli invention does not specifically disclose oxidation of impurities.

Wismann discloses a process similar to Piccoli for treatment of hydrocarbon liquids using an adsorbent (See title and abstract). Wismann also discloses removal of mercaptan sulfur from petroleum distillates by sorption or simultaneous sorption and oxidation (See page 1, lines 7-8). Wismann further discloses that as the mercaptan enters the pores, oxygen from air or some other source, also enters the pores and attacks the mercaptan to convert it to disulfide, which is highly soluble in oil within the pore. This allows a concentration gradient allowing influx of the mercaptan into pores and outflux of disulfides out with the distillate to produce sweet distillate product (See page 3, lines 1-6).

In view of Wismann disclosure, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Piccoli invention and add an oxidizing step as disclosed by Wismann to enhance removal of mercaptan sulfur from the distillate product. It is to be noted that oxidation converts mercaptans to disulfides (See Wismann, page 1, lines 19-21; page 2, lines 1-2; page 3, lines 2-4). Wismann also discloses reduction of total sulfur along with mercaptans (See page 9, lines 3-5). Thus, it is expected that a portion of sulfur is converted to oxides. Similarly, a portion of heteroatoms present in the hydrocarbon feed disclosed by Piccoli (See column 1, lines 8-11) is expected to convert to mono-oxides and dioxides as claimed because

Piccoli/Wismann invention is using a feed, adsorbent, and operating conditions as claimed.

8. With Respect to claim 11, Piccoli invention discloses using hydrocarbon streams of varying composition and origin, including fuel oil (See column 1, lines 10-11; column 2, lines 63-64; column 3, lines 48-55; column 5, lines 43-47; column 7, lines 14-19 ). It is to be noted that "hydrocarbon streams of varying composition and origin" encompasses all the claimed hydrocarbons.

Wismann also discloses using hydrocarbons comprising gasoline, naphtha, kerosene, diesel and fuel oils (See page 3, lines 17-19).

9. With respect to claim 18, Piccoli invention discloses that thiophene and higher homologs comprise mercaptans, benzothiophenes, thiophenes, alkylthiophenes, dialkylsulfides (See column 3, lines 38-41).

10. With respect to claims 20-23, Wismann invention discloses that oxidizing agents are selected from the group consisting of air, oxygen and hydrogen peroxide (See claim 7). Wismann also discloses that oxygen from any source can be used (See page 3, lines 1-2). Although Wismann does not specifically disclose using ozone, it is expected that any oxygen source, including ozone, should be equally effective in the oxidation process.

11. With respect to claims 26-40, 42, and 43, Piccoli invention discloses using an adsorber essentially consisting of silica gel modified with one or more metals from the elements of Group IV b, V b, VIII, I b, II b or from tin, lead or bismuth, preferably selected from zinc, iron, molybdenum, vanadium, tungsten, tin, platinum, copper and chromium (See column 2, lines 66-67; column 3, lines 1-5). Piccoli also discloses that the quantity of metals specified above is between 0.001 and 5 wt% with respect to the end catalyst.

Although, Piccoli invention does not specifically disclose the ratio of metals in the catalyst system, however, the invention does disclose one or more metals and the total percentage between 0.001 to 5 wt%. Also, since the ratio of metals in the finished catalyst is a result-effective variable, it is expected to be optimized by one with ordinary skill in the art by routine experimentation. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

12. With respect to claims 50-59, Piccoli discloses, "In the washing step, such as polar solvents, water, acetone, methanol, ethyl acetate, or their mixtures, such as hydrocarbons, paraffins with from 5 to 8 carbon atom, or aromatic, can be used" (Column 3, lines 13-16). Although Piccoli invention does not specifically disclose using ethanol, dichloroethane, dichloromethane, dichlorobenzene, however, it is to be noted that these solvents and their combinations are obvious variants of the disclosed solvents.

13. With respect to claims 60 and 61, Piccoli invention discloses that the impregnation is carried out and the water is removed by gently heating the solid under movement (See column 5, lines 8-10). Piccoli also discloses adsorption step at a temperature of 0 to 150°C and a regeneration step by means of thermal treatment in a stream of inert gas, at a temperature ranging from 100 to 200°C (See column 2, lines 40-47). Thus, it would have been obvious to one skilled in the art at the time of invention to modify Piccoli invention and specify the temperature in the drying step. It is expected that the temperature in the drying step will be in a range, including as claimed, because it should necessarily be lower than the temperature in the regeneration step in order to maintain catalytic activity. Piccoli's heating of solid under movement should have similar effect as that of blowing a hot gas during heating.

14. Claims 19, 45 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann") and further in view of Fleck et al (US Patent 2,925,381) ("Fleck").

15. With Respect to claim 19, Piccoli does not specifically disclose coal liquids.

Piccoli invention discloses host liquid to be hydrocarbon streams of varying composition and origin (See column 1, lines 10-11; column 2, lines 63-64; column 3, lines 48-55). It is to be noted that hydrocarbons from different origins comprise petroleum, and other carbonaceous liquids for example, shale and tar.



Fleck discloses a process similar to Piccoli for removal of organic nitrogen compounds from hydrocarbons using a sorbent (See title and column 1, lines 15-19).

Fleck also discloses using hydrocarbons including petroleum, coal tar oil fractions and shale oils among others (See column 1, lines 17-19, 46-50).

In view of Fleck's teaching, it would have been obvious to one with ordinary skill in the art at the time of invention to modify Piccoli invention and use coal liquids as disclosed by Fleck, because they are supposed to be functionally similar to the liquids used by Piccoli.

16. With respect to claims 45 and 46, Piccoli invention discloses the use of 13X zeolite as a sorbent, however, the invention does not specifically disclose the pore size of the zeolite.

Fleck discloses use of 10 X and 13X zeolites having pore diameters averaging 10 Å and 13 Å, respectively (See column 3, lines 74-75; column 4, lines 1-5). Therefore, it is expected that the zeolite used by Piccoli should also have pore diameter in a range including as claimed.

17. Claims 48 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Piccoli et al (US Patent 6,118,037) ("Piccoli") in view of Wismann et al (WO 01/42392 A2) ("Wismann") and further in view of Stowe (US Patent 5,035,804) ("Stowe").

18. With respect to claims 48 and 49, Piccoli discloses silica gel, zeolite, and inorganic oxides, for example alumina (See column 1, lines 41-44; column 2, lines 20-30, 65-67) as sorbent support, however, the invention does not specifically disclose perlite as a support.

Stowe discloses a process of removing hydrocarbons from water by adsorption over a sorbent including perlite and sand (See abstract).

In view of Stowe invention, it would have been obvious to one with ordinary skill in the art at the time of invention to modify combined Piccoli and Wismann invention by using perlite as a support for the adsorptive process because it is expected that perlite and silica gel would be functionally similar for adsorbing impurities. Also, since the percentage of perlite in the sorbent composition is a result-effective variable, it is expected to be optimized by one with ordinary skill in the art by routine experimentation. See *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

### ***Response to Arguments***

19. Applicant's arguments filed 02/05/2011 have been fully considered but they are not persuasive.

20. In the arguments on page 11, the Applicant argues that:

The Office Action correctly recites the teachings of Wismann but misapplies them to the present invention. Wismann is solely directed to the removal of

mercaptans from a hydrocarbon liquid while the present invention is directed to the simultaneous removal of a wide variety of impurities - thiophene, higher thiophene homologs, and heteroatom. Wisman does not disclose a process in which an impurity is oxidized and then adsorbed by a sorbent as required by the present invention. Instead, Wismann teaches a process in which mercaptans are oxidized to disulfides in pores of the adsorbent with the subsequent release of the disulfide back into the hydrocarbons. Although this fulfills the enunciated goals of Wismann in that the level of sulfides is reduced, the disulfide is not removed as required by the present invention but remains in the hydrocarbon. The results provided in example 2 of Wismann show that after treatment the mercaptan content was only 60 ppm where the mass sulfur content was still high at 0.22 weight percent. The high level of sulfur is in agreement with the notion that the disulfide leaves the pore and enters the hydrocarbon liquid.

In response, it is the examiner's position that the Office action uses Piccoli to teach every element of claim 62, except the oxidation step. Once the impurities are oxidized as disclosed by Wismann, they are adsorbed in the adsorbent as disclosed by Piccoli (See Office action above under claim 62). It is to be noted that mercaptan content of 60 ppm and mass sulfur content of 0.22 wt% shown in Table 1 of Wismann shows the specifications of the jet fuel used as feed (See page 4, lines 1-5) and not the results of oxidation as argued. The oxidation results are given for example, in Table 3 (See page 9) showing mercaptan content of the oxidized product of 0.0006 wt% (about 86% removal) and total sulfur content of 0.143 wt % (about 18% removal).

21. In the arguments on page 12-13, the Applicant cites Piccoli column 1, lines 33-48 and column 2, lines 6-23 and argues that:

It is clear that prior to the present invention, one skilled in the art would not view a combination of Piccoli and Wismann as providing in combination a process in which sulfides are oxidized and then removed by adsorption onto a sorbent since Piccoli calls for a hydrogenation while Wismann calls for an oxidation. Moreover, a proper reading of Wismann also reveals this to be true because the disulfide generated in that reference does not adsorb to the sorbent.

In response, it is the examiner's position that the cited portions of Piccoli are drawn to the discussion about the prior art methods for heteroatoms removal. Piccoli's invention is described for example, from column 2, line 62 onwards. As discussed earlier, Wismann is limited to oxidizing the impurities present in a hydrocarbon feed stream (See page 2, lines 23-26) and Piccoli is limited to adsorbing the impurities and producing a hydrocarbon stream free from impurities (See column 2, lines 62-67; column 3, lines 1-6).

22. In the arguments on page 13, the Applicant argues that:

Wismann carries out the oxidation of its process in a different manner than the present invention. In the present invention, the oxidizing agent is combined with the impure hydrocarbon liquid before contacting the sorbent. Wismann does not teach a process in which the oxidizing agent is mixed with the impure hydrocarbon liquid prior to contacting the sorbent. Although the present invention

is not limited to any particular theory of operation, it is plausible that the difference in the manner of introducing the oxidizing gas is one reason for the difference in operation of the present invention and, in particular, the adsorption of the oxidized impurities in the case of the present invention.

In response, it is the examiner's position that as discussed earlier, Wismann reference has been used to show the oxidation step. Once the impurities present in the hydrocarbon stream are oxidized as disclosed by Wismann, the treated stream is passed through the adsorbent bed of Piccoli to remove the oxidized contaminants. Therefore, the combined teaching of Piccoli with Wismann discloses a method of operation as claimed.

23. In the arguments on page 13, the Applicant argues that:

Neither Piccoli nor Wismann teach a process in which impurities are oxidized to mono-oxides or di-oxides and then adsorbed on a sorbent.

In response, it is the examiner's position that the combined invention of Piccoli and Wismann uses a hydrocarbon feed with impurities as claimed (See Piccoli abstract; Wismann, page 3, lines 17-19; page 9, lines 3-5). The combined invention also teaches an oxidizing agent as claimed (See Wismann, page 3, lines 1-2). The combined invention further teaches adsorbent bed and operating conditions as claimed (See Piccoli, column 2, lines 62-67; column 3, lines 1-6). Therefore, the combined teaching is expected to teach oxidation of impurities to mono- and dioxides as claimed.

24. In conclusion, the claimed invention is *prima facie* obvious Piccoli in view of Wismann, Fleck and Stowe.

### ***Conclusion***

25. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to PREM C. SINGH whose telephone number is (571)272-6381. The examiner can normally be reached on 7:00 AM to 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

PS 032011

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